CONVECTION DRIVEN FORCED FLOW AIR HEATER

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This invention relates to heating devices and deals particularly with a unit adapted for space heating in residences, offices, factories, etc.

The principal object of the invention to be described hereinafter is to provide a heating unit characterized by a rotating element arranged to force air through a heating system, said element being driven by convection currents created by the heater itself. A more specific object is to provide a heating device having a rotatable element adapted to be driven by convection currents produced by the combustion products, said rotatable element embodying a heat exchanger arranged to rotate therewith and also having fins adapted to force air and heat exchanger into a service heating system. Another object is to provide a heating unit of light construction which lends itself readily to manufacture in large or small units for special installation jobs. A further object is to provide an inexpensive heating device of the character described constructed of sheet metal throughout, said device having no motor driven parts which require maintenance but being characterized by a rotor which is arranged to circulate air through a heating system.

Other objects and advantages will become apparent as the description proceeds in conjunction with the drawings in which:

Figure 1 is a cross sectional view on line 1-1 of Figure 2; and

Figure 2 is a vertical sectional view substantially on the center line of my device.

Broadly speaking, my heating device may be roughly divided into three parts, generally designated as follows: the heating chamber A, the rotor B, and the outer shell or insulating casing C. It is to be understood that the above parts are round on all horizontal cross sections, as shown by Figure 1.

Referring to Figure 2, the arrangement and correlation of these parts will be seen. Here I have shown the combustion chamber A as being supported upon a base member 11 which is adapted to rest upon any support such as a floor F. Within the base member 11, I mount a burner generally designated 12, the burner in turn being supplied with an inflammable gas by a pipe 13. No claim is laid to the burner, since any suitable type of burner may be used. In this instance I have shown a round burner which is provided with a slot 14 at the upper end for emitting the gas. The base member 11 may be formed with holes 15 to admit air to the burner 12 which may be seated upon radial straps 16 suitably attached to the base member 11. Mounted upon the member 11 is a diverging member 17 that terminates in an upper open end 18. Over the open end 18, I mount a converging member 19, which terminates in a reduced open end 20. Centrally of the base member 11 and the members 17 and 19, I mount a cylindrical tube 21 which is held in position by the before mentioned strap 16 and a set of radial straps 22 at the upper end. At the center of the tube 21, I mount a shaft 23 which is rotatably supported in the tube at the lower end by means of a bearing generally designated 24, said bearing being supported upon a member 25 suitably mounted in the lower end of the tube 21. As shown, the shaft 23 is turned 30 at the lower end to a shoulder 26 which forms an end thrust bearing for the shaft. At the upper end of the tube 21, I provide another bearing generally designated 27 which may be supported in the end of the tube by any suitable means such as a member 28.

The member C is supported on the member A by a plurality of radial straps 29 which are suitably attached to the wall 17 of the member A and also to a circular apron 30, which in turn supports a converging element 31 that terminates in an upper open end 32. Over the upper end 32, I mount another member 33 which is equipped with an opening 34 and an outlet 35. The outlet 35 is adapted to deliver heated air for service and in practice may be connected to a register, conduit, etc., or in any other manner desired. The opening 34 terminates in a flange 38 which is adapted to receive a flue 37 for conducting the products of combustion to the atmosphere.

As before stated, the invention comprises a rotor adapted to be moved by convection for forcing air through a heat exchanger and into service. The rotor in this instance has been generally designated B and will be seen to be supported on the shaft 23. The means for supporting the rotor comprises flanges 38 and 39 which are fixed on the shaft 23 by any suitable means such as set screws 40 and 41 respectively. The flanges in turn are arranged to engage a heat exchange unit comprising in this instance two sizes of tubes designated 42 and 43. It is to be understood that various sizes of tubes may be used and any number of tubes found desirable may also be used. The tubes in this case are held fixed between upper and lower plates 44 and 45 respectively. The manner in which the tubes are fastened to the plates is unimportant in so far as the invention is concerned. Over the upper end of the tubes I mount a converging member 46 and over the upper end of the converging member 46 I prefer to use a short section of tube 47 which is of slightly less diameter than the inner diameter of the flue 37. The lower plate 45 of the heat exchanger is supported upon the open upper end of a converging member 48, said member 48 extending between the members 19 and 31 and forming inner and outer annular passages 49 and 50 respectively. On the bottom of the member 48, I may form a skirt 51 if found needful or desirable.

On the interior of the member 48, I mount a series
of inwardly extending vanes 53, said vanes being placed at an angle to derive a propeller effect, as shown in the dotted position. Also on the outer side of the member 49, I mount a series of vanes 53 which are adapted to work in the annular space 50. It will be noted by the dotted position of the inner vane 52 and the outer vane 53 that these vanes are disposed substantially parallel, the purpose of which will become apparent later.

In operation, air is heated by the burner 12 and rises in the direction of the arrows 54. As it passes out of the upper end 26 of the member 19, it impinges upon the vanes 53 and rotates the rotor B in the direction of the arrow 55 in Figure 1. As the air passes out of the upper end of the member 19, it draws more air through the annular passage 49 in the direction of the arrows 56. This air mixes with the air from the burner and completes the combustion of the gas in the chamber formed by elements 17, 19, and 48. Its force also impinges upon the vanes 52 and helps to rotate the rotor B. As the rotor B rotates, it carries with it the vanes 53 which work in the annular passage 50 and forces air to travel upwardly through the passage in the direction of the arrows 57. The air thus traveling through the passage 50 becomes heated through radiation of the heat from the combustion chamber and becomes further heated as it passes through the heat exchange unit comprising the tubes 42 and 43 in the direction of the arrows 58. It is to be understood that the heat exchange unit is part of the rotor and rotates therewith. The heat is supplied to the heat exchange unit by the heated air from the combustion chamber passing therethrough in the direction of the arrows 59. After passing through the heat exchanger, the products of combustion pass upwardly through the flue 37 in the direction of the arrows 60. The heated air for service is delivered through the opening 35 and passes outwardly therefrom in the direction of the arrows 61, where it may become effective for service.

I claim:

1. An air heater comprising an inner casing forming a combustion chamber, an outer casing arranged to provide an annular space around said combustion chamber, an intermediate casing forming a rotor adapted to rotate in said annular space and form an inner and an outer annular space, said rotor having inwardly extending vanes arranged to be propelled by convection air currents from said combustion chamber for driving said rotor, and outwardly extending fins spirally arranged thereon for forcing air upwardly through said outer annular space upon rotation of said rotor by said convection air currents.

2. An air heater comprising an inner casing forming a combustion chamber, an outer casing arranged to provide an annular space around said combustion chamber, a rotatable casing having a wall movably disposed in said annular space dividing the same into an inner and an outer annular passage, said wall having vanes extending inwardly over said combustion chamber adapted to be propelled by convection currents of air from said combustion chamber for driving said rotor, and spiral fins on the external wall of said rotatable casing adapted to force air upwardly through said outer annular passage upon rotation of said rotatable member by said convection air currents.

3. In an air heater having a combustion chamber with an outer casing annularly spaced therefrom, a rotor having a wall extending into said annular space dividing the same into an inner and an outer annular space, inwardly extending vanes on said wall arranged to be propelled by convection air currents from said combustion chamber for driving said rotor, and outwardly extending fins on said wall adapted to move in said outer annular space and force air upwardly therethrough upon rotation of said rotor by said convection air currents.

4. In an air heater having a combustion chamber with an outer casing arranged to form an annular space therebetween, a rotatably mounted casing having a wall arranged to divide said annular space into an outer passage leading to a service outlet from said heater and an inner annular space leading to said combustion chamber, inwardly extending vanes on the interior of said wall adapted to be propelled by convection air currents from said combustion chamber for propelling said casing, and external spiral fins extending outwardly from said wall into said outer annular space for conveying air therethrough to said service outlet upon rotation of said casing by said convection air currents.

5. In an air heater having a combustion chamber with an outer casing annularly spaced therefrom, a rotatably mounted casing having a wall extending into said annular space dividing the same into an inner and an outer annular space, a heat exchanger mounted on said casing adapted to rotate therewith and receive heat from air convection currents arising from said combustion chamber, inwardly extending vanes on said wall adapted to be propelled by said air convection currents to rotate said casing and heat exchanger, and outwardly extending spiral fins externally mounted on said wall adapted to force air through said outer annular space and said heat exchanger upon rotation of said casing by said convection air currents.

6. An air heater comprising an inner casing having a combustion chamber therein, an outer casing arranged to form an annular space around said inner casing, an intermediate casing rotatably mounted in said annular space dividing said space into an internal and an external annular chamber, said intermediate casing extending above said inner casing, and having vanes therein extending inwardly over said combustion chamber adapted to be propelled by air currents from said chamber to rotate said intermediate casing, there also being fins on the outer wall of said intermediate casing extending into said external annular chamber adapted to force air through said chamber upon rotation of said intermediate casing.

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